

2.7 National Aviation Research Plan Program Management

Mission

The program provides for the effective and responsible stewardship of the funds that users of the NAS have entrusted to the FAA for research and development. We strive to provide our customers the outputs and outcomes they most need in return for their investment.

Intended Outcomes

- This area supports FAA strategic goals and objectives in industry vitality, global leadership, business practices, and communications. Specifically, work in this area is directed towards better serving the interests of the nation and the flying public by:
- Increasing knowledge of the R,E&D program among the agency's customers and stakeholders.
- Increasing the participation of R,E&D customers and stakeholders in the program's formulation.
- Better managing limited R&D resources through more efficient and effective processes for the development and management of the FAA R,E&D investment portfolio.
- Fostering U.S. aviation industry leadership through international cooperation and harmonization in developing and implementing technologies that improve air traffic safety and efficiency.
- Achieving higher quality research and greater value through increased collaboration (partnerships) with the best academic and industrial R&D talent, both within the United States and internationally.
- Vitalizing the U.S. aviation industry by directing its R&D efforts toward the future technological needs of NAS users.

Program Area Outputs

- The (annual) *National Aviation Research Plan (NARP)*, formerly known as the *Federal Aviation Administration Plan for Research, Engineering & Development*.
- Periodic and special R,E&D Advisory Committee reports and recommendations.

- The annual FAA R,E&D Budget.
- International planning and implementation documents providing for world-wide aviation research harmonization and interoperability.
- Agreements with other international civil aviation authorities for the cooperative development of aviation systems research programs.
- Cooperative research agreements with academia, other government agencies, and industry.

Program Area Structure

The NARP Program Management effort is divided into the following areas:

1. Establish an Aging Transport Systems Advisory Committee to coordinate the Plan's initiatives.
2. R,E&D Strategic Management
3. R,E&D Portfolio Analyze
4. R,E&D Financial Management
5. R,E&D Advisory Committee
6. International cooperative research and development programs
7. Collaboration with NASA Field Offices
8. R,E&D Partnerships

Effective stewardship of the FAA R,E&D program requires that all NAS users receive the best systems and services achievable for their investment. In the first four elements just listed, the FAA ensures that its R&D program effectively targets the needs of those who rely on the NAS, that the agency provides for R&D in its budget and R,E&D Plan, and that it properly accounts for its R,E&D financial resources.

The remaining elements provide assurances that FAA is not funding research being duplicated elsewhere, particularly by NASA. FAA-funded researchers must have detailed knowledge of all similar research efforts, here and abroad, in order to be confident that their own work truly complements that of others.

The FAA must leverage its limited research dollars by sharing research resources with industry, academia, and other government agencies. The final program element, "R,E&D Partnerships," is directed toward this goal. Through its extensive network of R,E&D partnerships, the agency affords individual projects a single source of expertise and a consistent service element that helps them enter into cooperative research programs with minimal bureaucratic fuss. This element is described in detail in the "white sheet" for budget line item A10a, "Strategic Partnerships."

Customer/Stakeholder Involvement

The FAA relies upon the R,E&D Advisory Committee (REDAC) for guidance on its research and development programs. The REDAC includes representatives of associations, users, corporations, other government agencies, universities and research laboratories—all either customers or stakeholders of FAA products and services. The REDAC is actively involved in shaping, reviewing, and questioning what the agency is presently doing or considering for the future.

Accomplishments

NARP Strategic/Financial Management and Portfolio Analysis.

- The 1999 FAA *National Aviation Research Plan*, March 1999.
- The FY 2000 R,E&D Budget, January 1999.
- R,E&D Portfolio Development Process Re-engineering - Update, July-September, 1999.

R,E&D Advisory Committee.

(See Appendix A.)

R,E&D Coordinated Efforts and Partnerships.

Industry Research Programs Group:

- *Technology Transfer:*
- Negotiation/Award of Cooperative Research and Development Agreements.
 - Negotiation of Patent Licenses.
 - Technical Assistance to state and local governments, and other federal agencies.

- Technical Assistance to private industry to develop commercial products for the aviation market.
- Participation at technology conferences and expositions to inform potential new partners of the needs and capabilities of the FAA.

• Small Business Innovation Research:

- Design and installation, by Delta Systems, of an FAA compressed video telecommunications network for ATM RADARS.
- Commercial production of a compact neutron source, by Accsys Technology, for explosives detection.

• Cooperative Research and Development Agreements:

- Completion of a cooperative research and development agreement (CRDA) with the U.S. Air Force's Wright Laboratory—their premier aeronautics laboratory—for joint research in advanced flight control systems and improved reliability for aircraft engines, October 1996.
- Completion of a CRDA with the U.S. Air Force's Rome Laboratory—their premier C3I laboratory—for joint research in advanced air-to-ground communications and communication architecture research, August 1996.
- Negotiation of a CRDA with Boeing to build the National Airport Pavement Test Machine.

University Research Program Group:

• Aviation Research Grants:

- Award of a CRDA in FY97 to the Experimental Aircraft Association Foundation for joint research in satellite-based communications, navigation, surveillance, and air traffic control/management systems for the general aviation environment.
- Award of a CRDA in FY97 to L-3 Communications, to design, fabricate, and test a next generation high speed computed

- tomography system for explosives detection.
 - Negotiation, in FY97, of a total of \$10,000,000 in savings to the Government via cost sharing in awarded grants and CRDAs.
- Centers of Excellence:
 - Establishment, in FY-97, of a Center of Excellence in Airworthiness Assurance (COE-AWA) under the leadership of Iowa State and Ohio State Universities.
- Joint University Program:
 - Presentation of 15 RTCA Jackson Awards for excellence in aviation electronics.
 - Presentation of the first FAA Excellence in Aviation Award, two AIAA Major Field Awards in aviation meteorology, and one IEEE Major Field Award in control systems.
- University Fellowship Program:

- FAA Executive Steering Committee approval for a special training and development program to allow agency employees to become FAA Fellows.

R&D Partnerships

- Established partnership with Federal Quality Consulting Group on process reengineering.
- Received and incorporated the R,E&D Advisory Committee's guidance on the R,E&D Program.
- Established 125 research and development agreements with 19 countries and with a single air traffic organization representing 17 member states.
- Established an agreement with Eurocontrol to do cooperative research and development in air traffic management programs.

Long-Range View

Work in this area will continue as long as the FAA performs research and development. Expected resource requirements in the out-years will remain at about 3-5% of the total R,E&D budget.

A01a —System Planning and Resource Management

GOALS:

Intended Outcomes: The FAA intends that its R,E&D programs more effectively meet customer needs, increase program efficiency, and reduce management and operating costs. The FAA further intends to increase customer and stakeholder involvement in its programs by fostering greater proliferation of U.S. standards and technology to meet worldwide aviation needs.

Agency Outputs: The FAA prepares the annual R,E&D budget submission to Congress and publishes the annual *National Aviation Research Plan (NARP)*. The agency hosts three R,E&D Advisory Committee (REDAC) meetings per year as well as a number of subcommittee meetings. REDAC produces periodic and special reports providing advice and recommendations on the R,E&D program to the FAA.

Customer/Stakeholder Involvement: REDAC reviews the FAA's research commitments annually and provides guidance for future R,E&D investments. The Advisory Committee is limited to a maximum of 30 members. These members represent customer and stakeholder groups as well as subject matter experts from various associations, user groups, corporations, government agencies, as well as universities and research centers.

Accomplishments: Each year, the agency provides R,E&D program status information through the *National Aviation Research Plan* and submits the R,E&D budget requests to the Office of Management and Budget (OMB) and Congress. REDAC has provided the FAA with an independent strategic view on the agency's research commitments. In recent reports, the committee has reviewed the Air Traffic Services program area (March 1999) and the FAA's planned FY 2001 R,E&D Investments (April 1999). The Committee has also participated in a joint meeting with NASA's Aero-Space Technology Advisory Committee (January 1999).

R&D Partnerships: The FAA's R&D partnerships are described in each budget line item.

MAJOR ACTIVITIES AND ANTICIPATED FY 2000 ACCOMPLISHMENTS:

R,E&D plans and programs.

- Published the National Aviation Research Plan.
- R,E&D advisory committee.
- Submitted Committee review of and recommendations for FY 2002 R,E&D Program.
- Submitted Committee guidance for FY 2003 R,E&D Program.
- Participated in joint meetings with NASA's Aero-Space Technology Advisory Committee.

International.

- Worked with technical panels of the International Civil Aviation Organization (ICAO) [examples: the Automatic Dependant Surveillance Panel (ADSP), the Aeronautical Telecommunications Network Panel (AMCP), the Global Navigation Satellite System Panel (GNSSP) and the Review of the General Concept of Separation Panel (RGCSP)], and Offices within the Office of Research and Acquisitions (ARA) on the design and submission for approval of new Standards and Recommended Practices (SARPS).
- Worked with the Planning and Implementation Regional Groups (PIRGs) of ICAO to ensure that technologies and operational plans being implemented support the concept of a seamless global navigation system.
- Supported ASD-500 in its primary responsibility for ensuring that the international activities cited in this section are managed and coordinated within ARA to ensure the protection and defense of the interests of the United States.
- Supported additional ASD-500 responsibilities, including: (1) the Secretary of Transportation's designated chair of the Satellite Navigation and Communication (SV&C) Advisory Group of the Transportation Working Group (TPT-WG) of the Asia Pacific Economic Cooperation (APEC), and (2) the des-

ignated ARA Clearance Office for all international aviation policy issues coordinated through the Interagency Group on International Aviation (IGIA).

KEY FY 2001 PRODUCTS AND MILESTONES:

R,E&D plans and programs.

- Publish the National Aviation Research Plan.
- R,E&D advisory committee.
- Prepare Air Traffic Services Report.
- Prepare Airport Technology Report.
- Prepare Environment and Energy Report.
- Prepare recommendations on planned R,E&D investments for FY 2003.
- Prepare other reports as requested by the Administrator.
- Participate in joint meetings with NASA's Aero-Space Technology Advisory Committee.

International.

- Ensure global compliance with the Y2K issue.
- Obtain global acceptance of World Geodetic Standard-84 (WGS-84).
- Establish initial GPS for global enroute navigation.

FY 2001 PROGRAM REQUEST:

The FAA's R,E&D program strategic management encompasses four distinct steps to plan the program, and four steps to execute the plan. These steps differ markedly from project level tactical planning and execution. They neither replace nor duplicate those efforts. These steps provide a structured program portfolio that unifies customer needs with limited available resources.

Step one, the planning phase, identifies specific FAA outputs to achieve desired outcomes. This step must include customer and REDAC participation to accurately identify the research needed to meet product and service requirements.

Step two groups product and service requirements into six major service areas. Teams assigned to each of these areas study the requirements and devise an overall, integrated approach to satisfy it. The service areas provide a mechanism that groups similar requirements so that those related to a specific area, such as air traffic services, are considered together.

Step three develops a set of research projects to support the strategy; it also provides the necessary R&D products for the needed outputs once the service area establishes the integrated strategy in step two. To achieve desired outcomes in this step, the R,E&D Advisory Committee must provide input on the quality and potential of proposed research projects.

Step four establishes a cross-functional management team to review the work of the individual service area teams and to balance the work across the areas. This ensures the most important work is accomplished with the available resources. During this final step, the REDAC conducts a review of the proposed program and provides recommendations to FAA decision makers. The R,E&D investment portfolio should result and form the basis for the FAA's R,E&D budget submission to Congress.

The execution phase provides core, essential services across all the service areas. It produces the following:

- Financial management of the R,E&D program.
- Financial support for REDAC, a body of customers and aviation experts drawn from outside the FAA who provide guidance to the Administrator on R,E&D program planning and execution.
- Negotiation and execution of bilateral and multilateral agreements with international civil aviation authorities. These agreements establish cooperative R,E&D programs, system standards, and air traffic system procedures.

2000 FAA NATIONAL AVIATION RESEARCH PLAN

A01a - System Planning and Resource Management Product and Activities	FY 2001 Request (\$000)	Program Schedule					
		FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY2005
<i>011-130 R,E&D Plans and Programs</i>							
R,E&D Plans and Programs	\$854						
Publish Annual Plan for R&D		◆	◇	◇	◇	◇	◇
R,E&D Financial Management		◆	◇	◇	◇	◇	◇
Prepare Annual Budget Submissions		◆	◇	◇	◇	◇	◇
R,E&D Advisory Committee Reports	\$220						
Recommendations on FAA, RE&D Investments		◆	◇	◇	◇	◇	◇
Joint Meetings with NASA's Aerospace Technology Advisory Committee		◆	◇	◇	◇	◇	◇
Personnel and Other Costs	\$276						
Total Budget Authority	\$1,350	\$1,164	\$1,350	\$1,374	\$1,405	\$1,444	\$1,493

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Authority (\$ in Thousands)	FY 1997 Enacted	FY 1998 Enacted	FY 1999 Enacted	FY 2000 Enacted	FY 2001 Request
Contracts	200	1,164	385	1,164	1,074
Personnel Costs	1,378	0	685	0	246
Other Costs	282	0	94	0	30
Total	1,860	1,164	1,164	1,164	1,350

A01b —William J. Hughes Technical Center Laboratory Facility**GOALS:**

Intended Outcomes: The FAA test beds located at the William J. Hughes Technical Center (WJHTC) support R,E&D program goals to:

- Reduce the number of accidents and accident risk.
- Perform airspace studies and improve airspace design.
- Increase airport capacity.
- Reduce delays due to weather and system outages.
- Reduce unnecessary flight restrictions.
- Reduce user costs.
- Aircraft safety technology.
- System security technology.
- Human factors.
- Safe Flight 21.
- Environment and energy.
- Traffic alert and improved collision avoidance systems.
- Global Positioning System (GPS).
- Terminal Instrumentation Procedures (TERPs).
- Wide/Local Area Augmentation System (WAAS/LAAS).

The WJHTC maintains and operates the agency test bed laboratories utilized by R,E&D programs in achieving the above goals. These centralized test beds consist of non-operational NAS systems, aircraft, simulation facilities, communication systems, and a Human Factors Laboratory.

Agency Outputs: FAA programs develop the technical characteristics for new systems and procedures. R,E&D programs require their test beds to emulate and evaluate various field condition requirements. Human factors projects require laboratories to perform human-in-the-loop simulations, measure human performance, and evaluate human factors issues. Airborne and navigation projects require “flying laboratories” that are specially instrumented and reconfigurable to support different projects. Developmental programs require simulation systems to recreate realistic scenarios.

Customer/Stakeholder Involvement: The test beds directly support agency projects and integrated product teams in the following areas:

- Capacity and air traffic management technology.
- Communications, navigation, and surveillance.
- Operation concept validation.
- Free flight phase 1.
- Weather.
- Airport technology.
- Accomplishments: The technical laboratory facilities provide the test bed infrastructure to support R,E&D program goals and outputs.
- **R&D Partnerships:** In addition to the R,E&D programs listed, WJHTC laboratories cooperate with the Canadian Ministry of Transport, NASA, U.S. Air Force, Aircraft Owners and Pilots Association, Experimental Aircraft Association, International Civil Aviation Association, and academia.

MAJOR ACTIVITIES AND ANTICIPATED FY 2000 ACCOMPLISHMENTS:

The following programs have been supported by the laboratories:

- GPS/WAAS/LAAS
- TERPs
- Satellite communication
- Data link
- TCAS/ADS-B
- Separation Standards
- Automated Radar Terminal System (ARTS) IIIIE
- Host Replacement
- Y2K End-to-End Testing
- Runway Pavement Testing
- Aircraft deicing
- Aircraft security

- Traffic Flow Management laboratory

KEY FY 2001 PRODUCTS AND MILESTONES:

The test beds at the WJH Technical Center provide the necessary infrastructure for R,E&D programs to achieve their goals. Specific milestones

and products are contained within individual programs.

FY 2001 PROGRAM REQUEST:

The WJHTC will maintain and operate technical laboratories/facilities that support R,E&D programs.

2000 FAA NATIONAL AVIATION RESEARCH PLAN

A01b - William J. Hughes Technical Center Laboratory Facility Product and Activities	FY 2001 Request (\$000)	Program Schedule					
		FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY2005
011-140 WJHTC Laboratory Facility							
Systems Support Laboratory (En Route, Terminal, Automated Flight Station, Communications, and Scan Radars)	\$500						
Free Flight Phase 1		◆	◇	◇			
Operational Concept Validation		◆	◇	◇	◇	◇	◇
Capacity Initiatives (Airspace, Procedures)		◆	◇	◇	◇	◇	◇
Research & Development Laboratory (Target Generator Facility, Cockpit Simulator, Auto Tracking, Tech Center Data)	\$468						
Approach Procedures (SOIA)		◆	◇	◇	◇	◇	◇
Free Flight Phase 1		◆	◇	◇			
Separation Standards		◆	◇	◇	◇	◇	◇
Operational Concept Validation		◆	◇	◇	◇	◇	◇
GPS/WAAS/LAAS		◆	◇	◇	◇	◇	◇
CDT/ADS-B		◆	◇	◇	◇	◇	◇
Data Link		◆	◇	◇	◇	◇	◇
STARS		◆	◇	◇	◇	◇	◇
Aviation Support Laboratory (Aircraft)	\$2,500						
Satellite Communications and Navigation Programs		◆	◇	◇	◇	◇	◇
Separation Standards		◆	◇	◇	◇	◇	◇
Safe Flight 21		◆	◇	◇	◇	◇	◇
GPS/WAAS/LAAS		◆	◇	◇	◇	◇	◇
TERPS		◆	◇	◇	◇	◇	◇
Data Link		◆	◇	◇	◇	◇	◇
TCAS		◆	◇	◇	◇	◇	◇
ADS-B		◆	◇	◇	◇	◇	◇
Aircraft Safety		◆	◇	◇	◇	◇	◇
Human Factors Laboratory	\$450						
Air Traffic Control Human Factors		◆	◇	◇	◇	◇	◇
Airway Facilities Human Factors		◆	◇	◇	◇	◇	◇
Operational Concept Validation		◆	◇	◇	◇	◇	◇
Personnel and Other Costs	\$9,513						
Total Budget Authority	\$13,431	\$11,075	\$13,431	\$13,977	\$14,575	\$15,230	\$15,944

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Authority (\$ in Thousands)	FY 1997 Enacted	FY 1998 Enacted	FY 1999 Enacted	FY 2000 Enacted	FY 2001 Request
Contracts	3,435	3,341	3,268	3,300	3,918
Personnel Costs	2,627	3,905	6,462	6,988	8,044
Other Costs	538	800	0	787	1,469
Total	6,600	8,046	9,730	11,075	13,431

A01c — Center for Advanced Aviation System Development (CAASD)

GOALS:

Intended Outcomes: The FAA intends to apply expertise from the Center for Advanced Aviation System Development (CAASD) resources to air traffic service research to produce a safer, more efficient global air transportation system. Because it augments the agency's inhouse resources in conducting research for the Air Traffic Services (ATS) line of business, CAASD is an essential component of the FAA's research program.

Agency Outputs: The CAASD research program provides detailed reports, briefings, and concept demonstration systems for use in the evaluation of new Air Traffic Management (ATM) and control operating concepts and/or infrastructure replacements. These products are critical elements in the initial development of a more efficient, more available, and safer next generation ATM and control system.

CAASD provides new technology research for applications for global air traffic management, including new developments in traffic flow management, navigation, separation assurance, surveillance technology, and system safety.

Customer/Stakeholder Involvement: The FAA is challenged to increase safety in the nation's civil aviation system while increasing capacity and efficiency. Outcomes within CAASD's work program span system stakeholder as well as FAA issues and needs. Collaborative traffic flow management is included among these important issues and needs.

The CAASD R,E&D effort supports the RTCA Free Flight Steering Committee. This committee provides the principal collaborative forum among industry, aircraft operators, and FAA representatives in developing plans and requirements for the NAS to evolve to free flight. It defines operational needs leading to free flight and identifies the required affordable NAS Architecture that satisfies those needs.

Additionally, the CAASD R,E&D effort supports International Civil Aviation Organization (ICAO) in its efforts to develop worldwide navigation capabilities, including: (1) a wide-area augmenta-

tion system; (2) a local-area augmentation system; and (3) a worldwide air-ground communication capability using very high frequency air-ground digital radio. ICAO is the principal venue for international standards development and validation.

Accomplishments: CAASD supported the following accomplishments:

- Assisted in defining a longer term evolution of decision support capabilities to move the ATM system closer to free flight objectives.
- Supported surveillance server prototyping, development, and implementation; and refined the architecture, transition plan, and decommissioning strategies based on test results.
- Investigated procedures, user needs, system requirements, and architecture implications for enhanced information systems.
- Assisted in developing an investment strategy to ensure high-level design decisions based on an integrated evolutionary operational concept.
- Continued to provide the FAA with a strategic understanding of the role technology in developing the future ATM system.

R&D Partnerships: In accomplishing outcomes in the CAASD work program, extensive partnerships have been forged with industry suppliers, aircraft operators, operational FAA facilities, and other nonprofit research institutions. For example, CAASD maintains a cooperative research relationship with ATN Systems, Inc. in order to refine and validate the technical characteristics of an aeronautical telecommunications network router in a timely cost effective manner.

CAASD maintains a cooperative research relationship with the Florida Institute of Technology (FIT) to develop and validate the technical characteristics of flight information services broadcasts in a timely cost-effective manner. As a joint project with FIT, CAASD developed an air ground prototype to disseminate weather information to NAS users in flight.

**MAJOR ACTIVITIES AND ANTICIPATED
FY 2000 ACCOMPLISHMENTS:**

- Developed a greater understanding of the potential of free flight concepts to alter technology and processes for system operations, thus providing more flexible and efficient services.
- Continued investigating procedures, user needs, system requirements, and architecture implications for enhanced information systems.
- Made best use of Global Positioning System (GPS) and advanced avionics technology to reduce operating costs to NAS users.
- Continue to develop a greater understanding of free flight concepts and operating procedures, needed to fully implement associated programs.
- Continue to refine the architecture and transition plan, as well as strategies for planned FAA and user investment decisionmaking tools.

**KEY FY 2001 PRODUCTS AND MILE-
STONES:**

- Research new ATM and control operating concepts evaluation and/or infrastructure replacements.
- Integration of decision support system requirements with FAA and industry technology applications.

FY 2001 PROGRAM REQUEST:

Funding is requested for the following items:

- Development of free flight enhancements.
- Investigation of the expanded use of GPS and advanced navigation systems.
- Integration of decision support system requirements with FAA and industry technology applications.

2000 FAA NATIONAL AVIATION RESEARCH PLAN

A01c - Center for Advanced Aviation System Development (CAASD) Product and Activities	FY 2001 Request (\$000)	Program Schedule					
		FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY2005
<i>011-160 Center for Advanced Aviation System Development</i>							
Navigation and Surveillance	\$1,500						
Developed Navigation Architecture for Timely and Cost Effective Transition to Satellite-Based Navigation Systems		◆					
Assessed Future Surveillance Alternatives Using Automatic ADS-B Capabilities		◆					
Researched Low Cost Avionics Benefiting Free Flight Paradigm		◆					
Define Relationships Among Safety, Separation Standards, & Operational Capability to Enhance Safety Management		◆	◇	◇	◇	◇	◇
Investigate the Expanded Use of GPS and Advanced Navigation Systems		◆	◇	◇			
Traffic Flow Management (TFM)	\$3,500						
Identified Enhancements to Current TFM System		◆					
Developed System Architecture for Implementation of Data Link Infrastructure		◆					
Develop/Integrate FAA Decision Support Systems (DSS) with FAA and Industry		◆	◇	◇	◇	◇	◇
Develop Alternative Methods for Using GPS Technology Inclusion of Free Flight Concepts in Domestic Airspace		◆	◇	◇	◇	◇	◇
Incorporate GPS Technology into Ongoing Work in Area of Low Cost Avionics to Make Full Use of Traffic Alert and Collision Avoidance System (TCAS)		◆	◇	◇	◇		
Continue Investigating Procedures, User Needs, System Requirements, and Architecture Implications for Enhanced Information Systems		◆	◇	◇			
Develop a Greater Understanding of Free Flight Concepts to Potentially Alter Technology and Processes for System Operations		◆	◇	◇	◇	◇	◇
Research New Air Traffic Management and Control Operating Concepts Evaluation and/or Infrastructure Replacements		◆	◇	◇	◇	◇	◇
Develop Free Flight Enhancements		◆	◇	◇	◇	◇	◇
Integrate DSS Requirements with FAA and Industry Technology Applications		◆	◇	◇			
Personnel and Other Costs	\$0						
Total Budget Authority	\$5,000	\$4,900	\$5,000	\$5,041	\$5,114	\$5,220	\$5,365

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Authority (\$ in Thousands)	FY 1997 Enacted	FY 1998 Enacted	FY 1999 Enacted	FY 2000 Enacted	FY 2001 Request
Contracts	5,200	5,444	4,890	4,900	5,000
Personnel Costs	0	0	0	0	0
Other Costs	0	0	0	0	0
Total	5,200	5,440	4,890	4,900	5,000

A01d —Information Systems Security

GOALS: Presidential Decision Directive (PDD-63) calls for a national-level effort to protect the increasingly vulnerable and interconnected U.S. computer and communications infrastructure. Executive Order 13010 identifies aviation transportation among the key protection areas. This budget submission focuses on extraordinarily difficult and challenging technical problems that must be addressed as a part of protecting the FAA's system infrastructure.

Intended Outcomes: The FAA will improve information systems security by developing and evaluating technologies, technical information, and procedures that can be applied in many of its information systems, both new and legacy.

Agency Outputs: The research will transition into both future and legacy information systems used for all aspects of agency business, including the NAS, mission support, and administrative. Those systems will be more secure as a result of applying the new technology, improving the safety of the flying public, better protecting the nation's critical infrastructure, and enabling uninterrupted operations of the FAA.

Customer/Stakeholder Involvement:

- Internal stakeholders include all agency personnel since everyone routinely uses information systems for their business. Of special note are controllers (system availability and integrity), maintenance personnel (response to intrusions including system recovery), Aviation Security (incident analysis and enforcement), Regulation and Certification, Research and Acquisition, and the FAA Chief Information Officer (security system oversight).
- Federal stakeholders such as the President's Commission on Critical Infrastructure Protection, the Gore Commission, and the General Accounting Office have raised concerns about protecting the NAS information infrastructure in formal reports.
- External stakeholders include airlines and passengers (safety, efficiency, equipage, and maintenance); aircraft operators (safety, efficiency, equipage, and maintenance); pilots (safety); and International Civil Aviation Or-

ganization (standards and recommended practices).

Accomplishments: This is a new research and development program.

R&D Partnerships: Intended partners include Lincoln Laboratory, Massachusetts Institute of Technology, National Security Agency, Department of Defense, Department of Treasury, and NASA.

MAJOR ACTIVITIES AND ANTICIPATED FY 2000 ACCOMPLISHMENTS:

This is a new program.

FY 2001 PROGRAM REQUEST:

For each task under this program, the work will produce advanced information systems security technology and provide a proof-of-concept demonstration that will allow evaluation of that technology. For example, new real-time intrusion detection technology would be evaluated in the FAA's Computer Security Intrusion Response Capability facility, which is the agency's official program to monitor its information systems for attempted intrusions. New public key infrastructure technology would be evaluated in at least one FAA program for which traditional mechanisms require improvement to achieve efficiencies or security.

The research and development will focus on:

- Real Time Intrusion Detection and Monitoring—Significant engineering shortfalls complicate the building and deployment of Intrusion Detection (ID) systems for large, heterogeneous systems such as the National Airspace System (NAS). Current ID systems are not tailored to the security requirements of NAS operational systems. Current technology results in high false alarms and missed detection of actual intruders. The volume of audit data also requires a large personnel staff to analyze the reports. Integrating security data from the very large number of separate NAS subsystems will provide an unparalleled technical challenge. A research and development program is needed to develop intrusion detection technology tailored to FAA requirements and to integrate and tailor state of the

art commercial intrusion detection technology into FAA information systems.

- Architecture—FAA's information infrastructure is one of the largest and most complex in the world. Current techniques to architect the security of information systems need to be significantly improved to ensure that the points of greatest vulnerability have the greatest protection and so that those protections remain as the information systems evolve. A research and development program is needed to develop new architectural approaches and to integrate state of the art architectural approaches into the FAA's information systems security architecture.
- Defensive intelligent agents called BOTS (derived from robots) — Increasingly, intruders use hostile BOTS to seed systems with clandestine agents. Research of hostile BOTS can

lead to monitoring tools and development of defensive, intelligent agents. These methods and agents, used with intrusion detection systems, will improve intrusion detection and reduce false alarms. A research and development program is needed to analyze existing BOTS technology, and develop and test the effectiveness of intelligent agents in improving intrusion detection.

- Public Key Infrastructure— The FAA will improve information systems security by researching and developing technologies, technical information, and procedures for public key infrastructure. Such improvements will enable secure transactions over the internet, intranet, and in non-TCP/IP based networks such as those used in air to ground communications via the Controller Pilot Data Link Communications program.

2000 FAA NATIONAL AVIATION RESEARCH PLAN

A01d - Information System Security Product and Activities	FY 2001 Request (\$000)	Program Schedule					
		FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
011-170 Information Systems Security							
Real Time Intrusion Detection and Monitoring	\$1,500			◇			
Develop and Tailor Intrusion Detection Algorithms to the NAS and Other FAA System Requirements				◇			
Build and Test a New Proof of Concept Intrusion Detection System				◇			
Develop and Test Effectiveness of Intelligent Agents in Improving Intrusion Detection				◇			
Identify Countermeasures				◇			
Architecture	\$1,500			◇			
Techniques to Improve Effectiveness Against Unauthorized Access				◇			
Integrate State of the Art Architectural Approaches in the Information Systems Security (ISS) Architecture				◇			
Integrate ISS into the FAA Architecture				◇			
Defensive Intelligent Agents Called BOTS (Derived from Robots)	\$1,000			◇			
Development of Monitoring Tools				◇			
Development of Defensive, Intelligent Agents				◇			
Integrate with Intrusion Detection				◇			
Analyze Existing BOTS Technology				◇			
Public Key Infrastructure	\$1,500			◇			
Research and Develop Technologies, Technical Information and Procedures for PKI				◇			
Integrate and Test Developed PKI Technology into the FAA Architecture for Secure Transactions Over the Internet, Intranet, and in Non-TCP/IP Based Networks Such As Used in Air to Ground Communications via the Controller-Pilot Data Link Communications (CPDLC) Program				◇			
Personnel and Other Costs	\$0						
Total Budget Authority	\$5,500	\$0	\$5,500	\$5,545	\$5,625	\$5,743	\$5,901

Note: Out year numbers are for planning purposes only. Actual funding needs will be determined through the annual budget process.

Budget Authority (\$ in Thousands)	FY 1997 Enacted	FY 1998 Enacted	FY 1999 Enacted	FY 2000 Enacted	FY 2001 Request
Contracts	0	0	0	0	5,500
Personnel Costs	0	0	0	0	0
Other Costs	0	0	0	0	0
Total	0	0	0	0	5,500

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